

of the cavity, an ovoid burrow from the opposite side of the boulder intersected the hole in a manner which provided a small window through which the siphon could be extended (see Fig. 1). This enabled the clam to carry on normal filter-feeding activities although lodged "in the wrong direction" in the burrow.

This limiting ecologic niche so altered the shape of the shell that the position of the beak is medial rather than from one-third to one-fourth the distance from the anterior to the posterior end. The anterior end is pointed while the posterior end is broad and truncate, whereas in several normal specimens of *Tresus nuttalli* collected from the Santa Cruz locality, the posterior extremity is somewhat pointed while the anterior extremity is rather broadly rounded. The dentition and pallial markings on the inner surface of the valves, as well as the posterior gape for the siphons, compare favorably with normal specimens of this species.

Tresus nuttalli is usually found burrowing in sandy substrates, to considerable depths in the adult stage of development. The burrows are perpendicular to the surface. It is a common member of the burrowing fauna in sandy tidal flats near the mouth of Elkhorn Slough, 18 miles southeast of Santa Cruz, where it is ac-

tively sought by clam diggers. The species is found living, often in great abundance, in bay or estuarine and protected outer-coast environments. The bathymetric range is from the intertidal zone down to depths of 100 feet or greater (Fitch, 1953). The geographic range is from the Straits of Georgia, British Columbia (Quayle, 1960), to Scammons Lagoon, Lower California (Fitch, 1953).

Literature Cited

ARNOLD, RALPH

1908. Descriptions of new Cretaceous and Tertiary fossils from the Santa Cruz Mountains, California. Proc. U. S. Nat. Mus. 34 (1617): 345-389; pls. 31-37.

BRADLEY, WILLIAM C.

1956. Carbon-14 date for a marine terrace at Santa Cruz, California. Bull. Geol. Soc. Amer. 67 (5): 675-677.

FITCH, JOHN E.

1953. Common marine bivalves of California. Calif. Dept. Fish and Game, Fish. Bull. 90: 1-102; 63 figs.

KEEN, A. MYRA

1962. Nomenclatural notes on some West American mollusks, with proposal of a new species name. The Veliger 4 (4): 178-180.

QUAYLE, D. B.

1960. The intertidal bivalves of British Columbia. Brit. Columb. Provinc. Mus. Handbook 17: 5-104; illus.

Notes on the California Species of *Aplysia* (Gastropoda : Opisthobranchia)

BY

ROBERT D. BEEMAN

Hopkins Marine Station of Stanford University
Pacific Grove, California

In preparation for the forthcoming key to the California opisthobranchs, it has been necessary to attempt to resolve some of the problems concerning the distribution and systematic status of the *Aplysia* of California. This information is published here to avoid bulk in the key's text. The subgenera given are those used by Eales (1960) in her revision of the world species of *Aplysia*.

1. Subgenus *Pruvotaplysia* ENGEL, 1936

Eales (1960) and Baba (1949) have indicated that California is included in the range of *Aplysia parvula* Guilding in Mörch, 1863. The only record of an actual collection from any point near to California seems to be that (as *Tethys*) of MacFarland (1924). He reported on three

somewhat macerated specimens from San Marcos Island, Gulf of California, Mexico. Therefore, A. parvula should not presently be considered as a California species.

2. Subgenus Neaplysia COOPER, 1863

Aplysia californica Cooper, 1863, is the most common sea hare in California. Aplysia nettiae Winkler, 1959, should be considered as a synonym of A. californica as the differences between the two are too small to be of specific importance. Its author, Dr. L. R. Winkler (Loma Linda University, written communication, January 1962), states that A. nettiae "may be the result of mutations with limited survival time". Eales (1960) also doubted the specific status of this form.

3. Subgenus Varria EALES, 1960

Although Eales (1960) reports Aplysia dactylomela Rang, 1828, as having worldwide distribution, there evidently have been no collection records for it from California.

The single known specimen of Aplysia rehderi Eales, 1960, is reported to be from Monterey, California (Eales, 1960). According to Dr. N. B. Eales (University of Reading, written communication, March 1962), the reference to A. rehderi as a Gulf of California species (Eales, 1960, p. 379) is a misprint. The locality label of this specimen (United States National Museum #575055) is open to question. J. H. McLean (Stanford University, written communication, July 1962) reports that this label's information was taken from the National Museum's old card filing system no. 1879 and did not include a date, collector, or more exact collection than just "Monterey". Dr. H. A. Rehder (United States National Museum, written communication, August 1962) confirms this, but he states that the 1879 may refer to the date of museum acquisition. My research work is now based at Monterey Bay, California, and I know of no species of Aplysia other than A. californica having been collected locally. In view of this confusion, A. rehderi cannot be seriously considered as a California species at present.

4. Subgenus Aplysia LINNAEUS, 1767

Aplysia juliana Quoy & Gaimard, 1832, was listed by Eales (1960) as having been collected in California. She later stated (University of Reading, written communication, March 1962) that the record of A. juliana in California could not be traced and that such a record of A. juliana is doubtful". J. R. Lance (Scripps Institution of Oceanography, written communication, February 1962) states that a similar note from Dr. Eales came too late to prevent A. juliana from being included in his southern California opisthobranch distribution list (Lance, 1961).

Aplysia vaccaria Winkler, 1955, is quite common in southern California.

Aplysia reticulopoda Beeman, 1960, is known only from southern California. This species should now be referred to the subgenus Aplysia rather than Tullia.

Aplysia cedrosensis Bartsch & Rehder, 1939, is known only from the Gulf of California and therefore is not a California species.

Aplysia cedrosensis and A. vaccaria seem more closely related to each other than either of them is to A. reticulopoda. The distinctions between A. vaccaria and A. reticulopoda have already been introduced (Beeman, 1960). Some comparisons of A. reticulopoda with A. cedrosensis and A. juliana are of interest. Although the latter two species are not California species, they are the only other members of this subgenus found in the north Pacific area. The following notes contrast A. reticulopoda with the information on A. cedrosensis and A. juliana given in Eales (1960) and Bartsch & Rehder (1939). It must be remembered that this represents study on only a few preserved specimens. Study must be made of large series of the fresh animals before really definitive and quantitative criteria can be established.

The proportions of Aplysia reticulopoda are quite different from those of A. cedrosensis and A. juliana; the head and neck appear as part of the body outline rather than as a projection from it. The skin is very smooth, not rough and warty. The cephalic tentacles are not well rolled and connected to the mouth as in A. juliana. The foot is proportionately wider and does not have lateral wings along the body or a suck-

er. The compound nature of the penial sheath warts contrasts with *A. cedrosensis*; their elaborate complexity may contrast with *A. juliana*. A glance at the illustrations of *A. reticulopoda* and *A. cedrosensis* (Beeman, 1960; Eales, 1960) shows that *A. reticulopoda* has a far more tightly closed parapodial enclosure. The short, simple, thick, tubular, anal siphon especially contrasts with the broad, nontubular siphon of *A. cedrosensis*. The number of lateral teeth (56) in the radula is much lower than *A. cedrosensis* (80) and much higher than *A. juliana* (40); the number of rows (119) is much greater than in *A. juliana* (70).

In summary: Only *Aplysia californica*, *A. vaccaria*, and *A. reticulopoda* can presently be considered as valid California species of the genus *Aplysia*. Distinctions within the subgenus *Aplysia* are considered.

Literature Cited

- BABA, KIKUTARŌ
1949. Opisthobranchia of Sagami Bay. 4 + 2 + 194 + 7 pp.; pls. 1-50; 161 textfigs.; Iwanami Shoten, Tokyo.
- BARTSCH, PAUL, & HARALD A. REHDER
1939. Mollusks collected on the Presidential cruise of 1938. *Smithson. Misc. Coll.* 98 (10): 1-18; pls. 1-5.
- BEEAMAN, ROBERT D.
1960. A new tectibranch, *Aplysia reticulopoda*, from the southern California coast. *Bull. So. Calif. Acad. Sci.* 59 (3): 144-152.
- EALLES, N. B.
1960. Revision of the world species of *Aplysia* (Gastropoda, Opisthobranchia). *Bull. Brit. Mus. (Nat. Hist.) Zoo.* 5 (10): 267-404; frontispiece; 51 textfigs.
- LANCE, JAMES R.
1961. A distributional list of southern California opisthobranchs. *The Veliger* 4 (2): 64-69.
- MACFARLAND, FRANK MACE
1924. Expedition of the California Academy of Sciences to the Gulf of California in 1921. Opisthobranchiate mollusca. *Proc. Calif. Acad. Sci., ser. 4*, 13 (25): 389-420; pls. 10-12.

A Revised List of Chitons from Guadelupe Island, Mexico (Mollusca : Polyplacophora)

BY

ALLYN G. SMITH

Associate Curator, Department of Invertebrate Zoology
California Academy of Sciences, San Francisco 18, California

Emery P. Chace, Curator of Mollusks, San Diego Society of Natural History, included six species of chitons in a general list of marine mollusks from Guadelupe Island, Mexico. This list of chitons may now be augmented as a result of the collecting trip to the Island in 1946 by M. Woodbridge Williams, who brought back an interesting series of specimens, principally from tidepools. The chitons were mostly preserved in alcohol and deposited in the mollusk collection of the California Academy of Sciences.

In the following revised list, the records published by Chace (1958) are indicated as "C"; the records of Williams as "W". Numbers of specimens collected are shown in parentheses ().

LEPIDOPLEURIDAE

Leptochiton rugatus (Carpenter in Pilsbry, 1892)
— C (1); W (1), a juvenile dredged in 26 fathoms off the south side of the Island, 9 December 1946 (CAS 32747), is tentatively referred to this species.